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(51) INT CL[4]
B60P 1/44

(52) Domestic classification (Edition I)
B8E 22B1

(56) Documents cited
GB 1167745

(58) Field of search
B8E
Selected US specifications from IPC sub-class B60P

(54) **Vehicle lift**

(57) A cantilever type tail lift 1 comprises a parellelogram linkage having a base member 12 disposable at the vehicle underside 11, an articulated link member 14 and a telescopic link member 15, and a movable member 16 having a ramp 7 extending therefrom. The members are pivotally interconnected so that said ramp 7 is movable between a lowered position and a raised position adjacent vehicle platform 6, whilst remaining generally parallel to said load platform 6, by a first displacement means 19. The movable member 16 and ramp 7 are pivotable relative to the articulated link member 14 without susbstantial pivotal movement of the telescopic link member 15 and with partial telescoping of the telescopic link member 15, so as to swing the movable member 16 with the ramp 7 to a folded condition up and over relative to the articulated link member 14. The articulated link member 14 ia then at least partly foldable upwardly by a further pivotal displacement means 31 with further telescoping of the telescopic link member 15, the link members 14, 15 then being further pivotable upwardly relative to the base member 12 towards the vehicle underside 11 by the first pivotal displacement means 19.

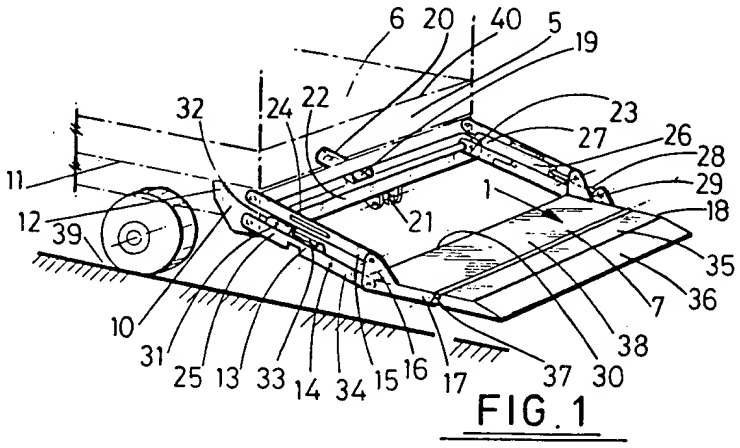

FIG. 1

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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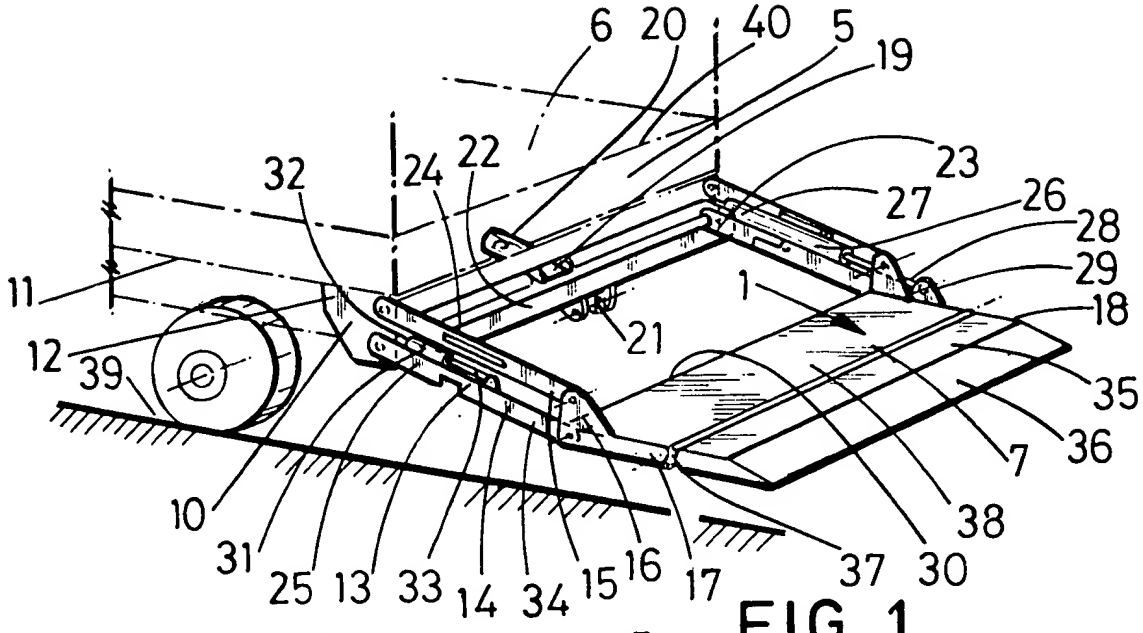

FIG. 1

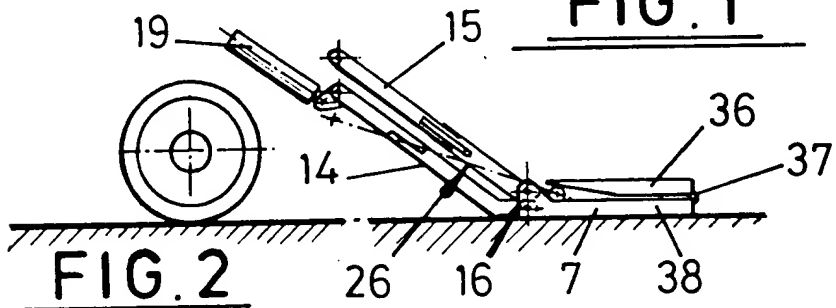

FIG. 2

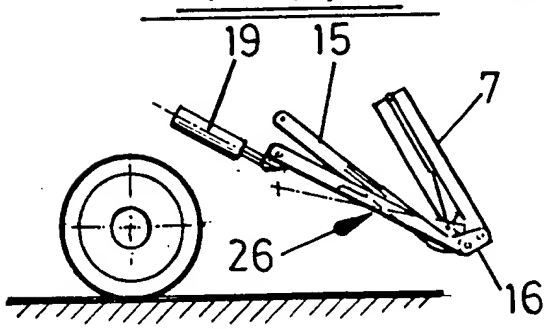

FIG. 3

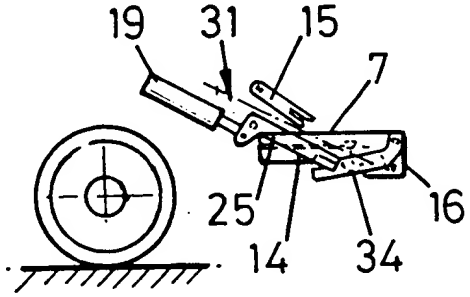

FIG. 4

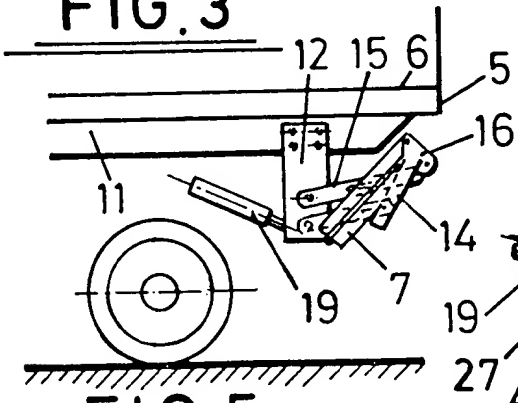

FIG. 5

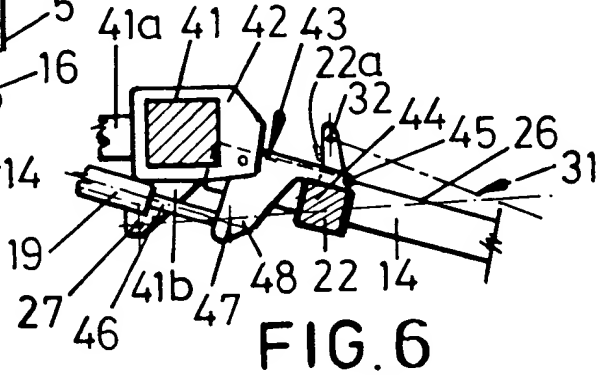

FIG. 6

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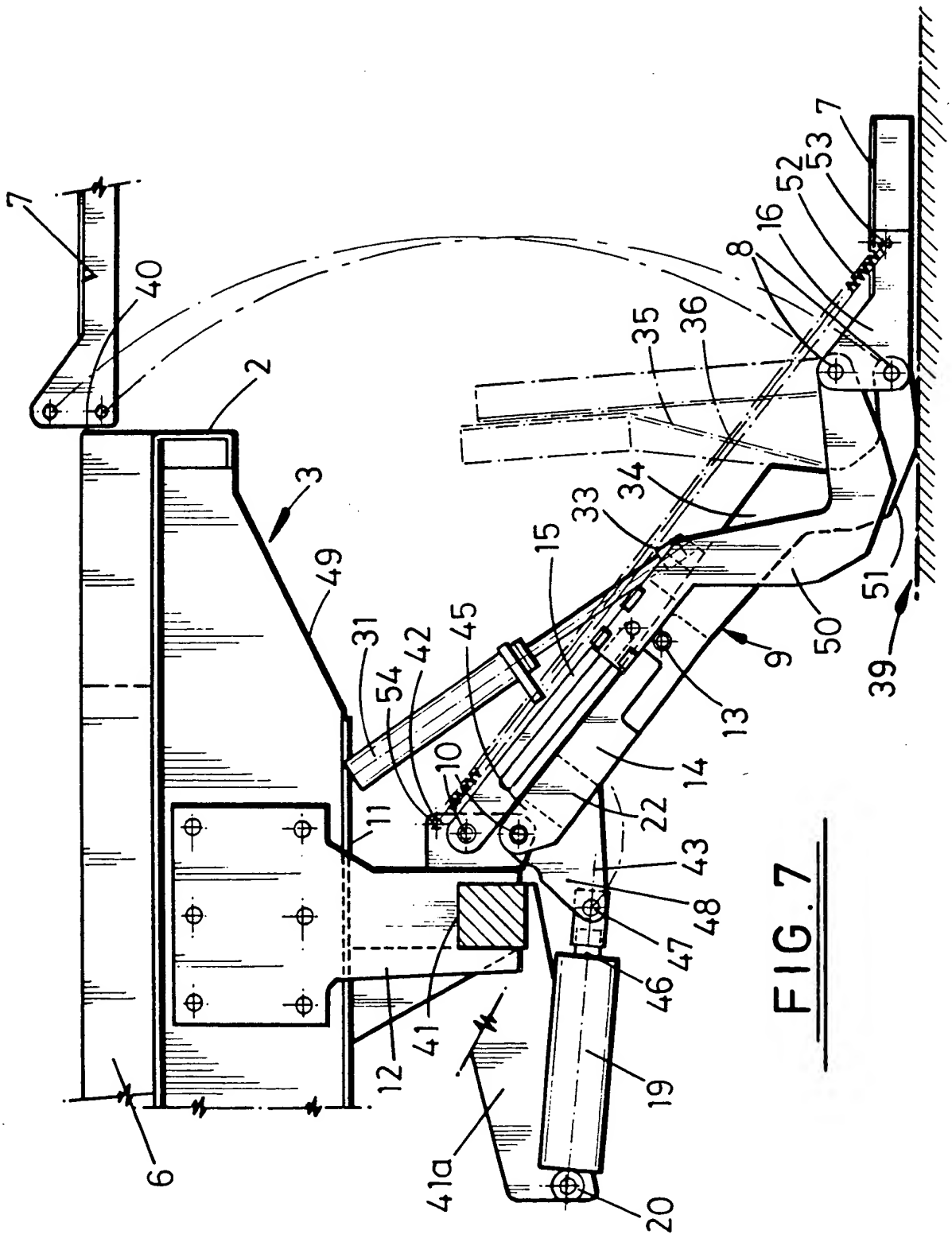

FIG. 7

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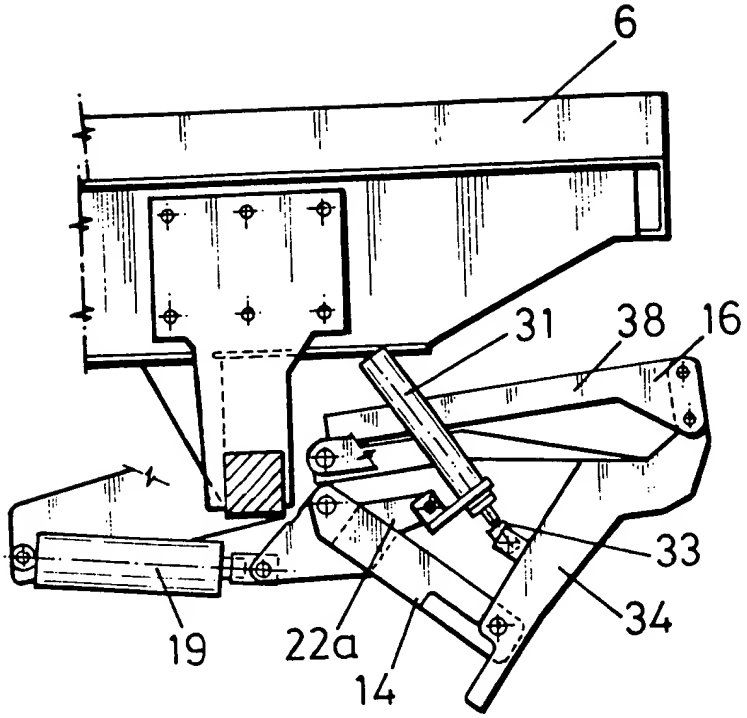

FIG. 8

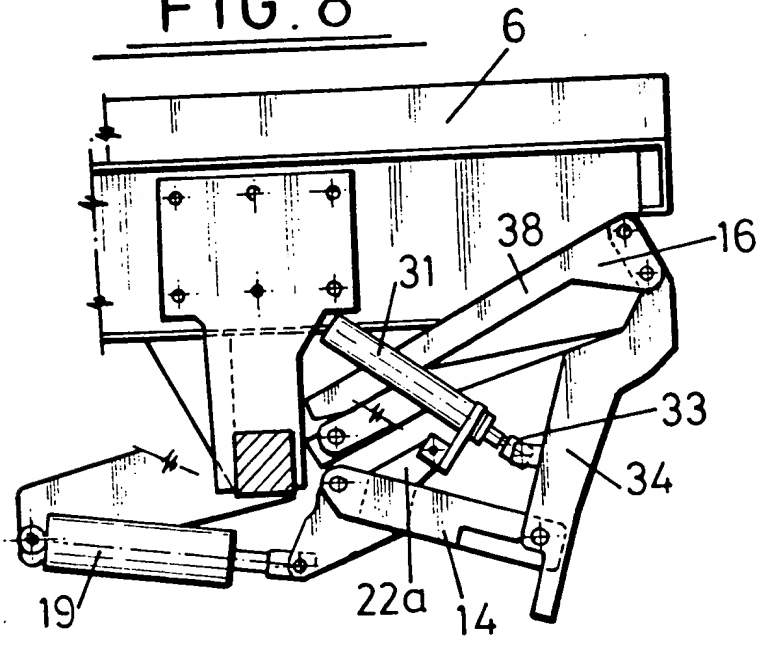

FIG. 9

SPECIFICATION

Platform lift

The invention relates to platform lifts.

The invention is particularly, though not exclusively, applicable to platform lifts which can be mounted on a vehicle. Known forms of such lift can be mounted at the back of a vehicle, as illustrated in UK patent specifications Nos 1,131,564; 1,529,055; and 2,024,767A (Ratcliff). They are known as vehicle tail lifts. They consist essentially of two parallel spaced-apart upright guide members, fixed one on either side of the vehicle rear access opening and carrying the platform between them. Between the guide members is mounted a beam, housing the lift actuating mechanism: this normally consists of a hydraulic ram which raises and lowers the platform up and down the guide members via a system of pulleys and cables. In use, the platform stays substantially horizontal as it travels between the vehicle access opening and the ground on which the vehicle stands. When not in use, the platform is raised to the level of the vehicle access opening and is then swung up flat against the guide members and held there as the vehicle travels from one location to another.

These vehicle tail lifts are widely used. However they have several drawbacks. They are bulky and heavy, and so they put considerable strain on the back axle and suspension of the vehicle which carries them. For the same reason, they limit the payload which can safely be put onto the vehicle chassis, suspension and tyres. They are not suited to light delivery vans for these reasons, and also because they would make such vans unstable when unloaded. They are especially unsuited to small passenger-carrying coaches or other public service vehicles which demand a side-opening, not a rear-opening, access door and which would be completely unbalanced by a tail lift of the kind illustrated in these UK patent specifications.

Less bulky tail lifts have been developed to try to cater for the needs of light delivery vans. Examples are shown in UK patent specifications Nos. 1,220,757 and 1,475,324 again published in Ratcliff's name. These consist again of two parallel spaced-apart guides carrying the platform between them and fixed one on either side of the vehicle rear access opening, but they also incorporate a deformable parallellogram linkage which initially swings the platform out of the rear of the vehicle before load lifting and lowering begins. The platform is raised and lowered along the guides as in the basic unit above. When not in use, it is swung, by folding the linkage, back into the rear of the vehicle, and swung upwards to lie flat against the guides; and the rear doors of the vehicle can then be closed on it for vehicle travel.

This light form of tail lift is less heavy than the basic tail lifts first discussed, but for its size, and given the size of van it is intended to fit, it is still unacceptably heavy. Like the basic lift, it uses the ram-operated cable and pulley system which is by no means totally reliable and in which the stroke of the ram, and effective lift of the cables, is limited by the width of the van. Like the basic units, it also requires the vehicle to be especially adapted to take it. Worst of all, the platform, the linkages, and the guides take up a considerable amount of the vehicle loading space, because they have to be mounted well into the vehicle in order for the vehicle doors to close on them for vehicle travel.

This second form of tail lift is still not suitable for vehicles with side access to their load carrying areas. Other attempted ways of combining the deformable parallellogram linkage construction with a straight up-and-down platform movement have led to construction such as that shown in the Ratcliff UK patent specification No. 1,413,182 which is more bulky and heavy than ever and is totally unsuited to any form of light van or coach.

The Ratcliff UK patent specification No. 1,446,656 does show one form of platform lift developed specifically for use with a side-entry van. This uses a deformable parallelogram linkage to move the platform between the van loading area and the ground on which the van stands. When not in use, the lift as a whole is stowed underneath the van. This construction certainly achieves an improvement in so far as it is considerably lighter in weight than the previous Ratcliff constructions referred to above. However when stowed it is extremely vulnerable. It is also, still, a considerable weight relative to the weight of the vehicle, and it is stowed in a potentially dangerous lopsided position to one side of the centre line of the vehicle chassis: if the vehicle is not carefully loaded, to compensate for this, excessive strain is placed on the chassis, and the vehicle handling characteristics can be dangerously affected. The length of the platform itself is limited by the need to accommodate the platform within just under half the vehicle body width, and the construction has not found wide usage commercially.

In summary, all these prior Ratcliff lifts exhibit the same recurring drawbacks. They are relatively heavy for the size of vehicle they are intended to fit. When stowed, they affect the weight distribution of the vehicle, or they take up an undue amount of its loading space, or both. The size of platform, and lift stroke, is limited because of the positioning of the lifting mechanism and the way in which it operates. Finally all of them share the common feature that once the platform has reached the load-carrying floor of the vehicle it cannot then take the load forward into the vehicle: the load must positively be transferred from the platform into the vehicle before the platform can either be lowered again or stowed.

The invention seeks to provide a platform lift which is suitable for use with rear-loading or side-loading vehicles; which can travel with the vehicle without putting undue strain on the vehicle without taking up an inordinate amount of payload space; which will maximise the platform whilst allowing the platform to travel with its load into the load-carrying area of the vehicle; and which will generally be more reliable, more adaptable, and more versatile than the prior units discussed above.

In a platform lift embodying the invention in its broadest aspect, a load lifting and low ring platform

is pivotally suspended on the adjacent ends of the arms of a deformable parallellogram linkage; the other ends of the linkage arms are pivotted to a chassis which is or can be mounted to travel back and forth out of and into a load-carrying area, for example a vehicle body, serviced by the platform; such back and forth travelling movement of the chassis causes one of the arms of the linkage (or a part connected thereto) to engage a curved surface; and the arm (or said part) is forced to follow the curvature of that surface, thus automatically unfolding or folding the linkage and thereby lowering or raising the platform.

Such a construction lends itself ideally to an arrangement in which, with the parallellogram linkage folded, and the platform, the travelling chassis, and the linkage arms all occupying substantially the same plane (or at least lying closely adjacent one another), the platform can move into the load-carrying area to discharge its load; or to be stowed within the vehicle during vehicle travel; or even to be stowed within the vehicle with the load still carried by the platform. This last case is particularly advantageous when carrying such things as invalid wheelchairs and their occupants, since they can be lifted into the vehicle, carried to their destination, and lowered from the vehicle, all without having to move off the platform.

The curved surface may be a rigid surface, fixed to or forming an extension of the load-carrying area, and possibly retractable when the platform is not in use. It may alternatively however comprise a flexible bar which can deform into a rigid curve and which can be straightened in order to be more easily retracted. Such a flexible bar could travel back and forth with the travelling chassis, deforming into a rigid curve in order to unfold the parallellogram linkage as the chassis moves one way, and progressively straightening to fold the linkage as the chassis moves the opposite way. In the case just outlined, the end of the flexible bar not secured to the travelling chassis may be pivotally secured to said one of the linkage arms, but this is not essential.

Any or all of the platform lowering, lifting and stowing stages of movement may be power operated or hand operated, possibly with spring assistance especially for any hand operated stage. For example the parallellogram linkage may unfold against a spring action which subsequently assists in folding the linkage and thus raising the platform and its load. Means would preferably be provided to lock the linkage, against the spring action, in such a case when the platform was being loaded: such means, when unlocked, would allow the spring action to assist in swinging the platform and its load towards the load-carrying area.

The platform, or the lift as a unit, may be held in its stowed position by doors closing off the loading area. Alternative or additional retaining means may be provided, for example a safety catch which may allow the platform to be raised to the level of the load-carrying area but which must positively be released before the platform can travel into the load-carrying area. Whatever arrangement is adopted, if the platform, the travelling chassis, and the parallellogram linkage all fold into substantially the same plane, and preferably slide into a gap into the floor of the load-carrying area, the lift when stowed takes up hardly any of the payload space.

Where the lift is wholly or partly power operated, suitable power packs are already part of the common general knowledge in this field. The prior UK patent specifications referred to above, together with other UK patent specifications published in the name of John Ratcliff (Tail Lifts) Limited, or Ratcliff Tail Lifts Limited, give ample details of various power mechanisms, safety mechanisms, locking mechanisms and the like.

Several forms of platform lift each embodying the invention are shown in the accompanying drawings. They will now be described with reference to those drawings. They are only examples of forms which the invention might take within its broadest aspect.

In the drawings:

Figures 1a, 1b and *1c* show a first platform lift in respectively side elevation, plan and end elevation;

Figures 2a and *2b* show in side elevation and plan a variation on the lift of Figure 1;

Figures 3a, 3c and *3d* show in side elevation various stages in the lifting movement of another platform lift, shown in Figure 3b in plan;

Figures 4a to *4f*, drawn to an enlarged scale, show in detail some important parts of the lift illustrated; and

Figure 5 shows in perspective another lift embodying the invention.

The platform lift shown in Figures 1a to 1c is a power operated lift which is fitted, in use, to the rear of a light delivery van. Parts of the van are shown diagrammatically in the drawings, but it is not necessary to illustrate or describe it in any detail. The van rear wheels are referenced 11, the chassis 12, and the body 13. The van has double opening doors respectively 14, 15 which are shown only in Figure 1b. The original floor level of the van is indicated at 16, but a new, false floor has been built up to a level 17 to receive loads from the platform lift.

When the doors 14, 15 are opened, the body side frames 18, 19 define with the false floor 17 the extent of the rear access opening of the van body.

The platform of the lift is referenced 21. It is hinged approximately half way along its length, as indicated at 22, so that it can fold right over clockwise (when viewed as in Figure 1a) on top of itself for stowage within the vehicle. The platform is of substantial size, and would normally be braced and stiffened underneath and be of welded steel construction. It is not necessary to describe the construction in detail. The top surface of the platform, which presents a substantially flat and uninterrupted loading surface, may be treaded or given some other anti-slip treatment.

The platform 21 is suspended pivotally on the adjacent ends 23a. 24a of the arms 23, 24 of a deformable parallellogram linkage. The other ends 23b, 24b of the arms 23, 24 are pivotted to a chassis 25 which, with the arms 23, 24 and the platform 21, forms the parallellogram.

A fluid pressure operated ram 26 is mounted inside the van body 13 and runs alongside the

substantial longitudinal rigidity in its fully extended condition.

5. A lift according to any one of claims 1 to 4 wherein is provided an auxiliary pivotal displacement means for effecting the pivotal displacement of the ramp and movable member relative to the articulated link member in the unfolded position of said articulated link member.

6. A lift according to claim 5 wherein said auxiliary pivotal displacement means is formed and arranged for acting between the base member and the ramp.

7. A lift according to any one of claims 1 to 6 wherein said pivotal displacement means are in the form of pressurized fluid operated piston and cylinder means.

8. A lift according to any one of claims 1 to 7 when mounted at the underside of a goods vehicle load deck immediately behind an edge of said deck at which edge there is open access to a loading surface of said load deck.

9. A vehicle lift substantially as described hereinbefore with particular reference to Figures 1 to 6 or Figures 1 to 6 as modified by Figures 7 to 9 of the accompanying drawings.

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